Answer the Big Question

How Do Scientists Work Together to Solve Problems?

You began this Unit with the question: *How do scientists work together to solve problems?* You addressed several small challenges. As you worked on those challenges, you learned about how scientists solve problems. You will now watch a video about real-life designers. You will see the people in the video engaging in activities very much like what you have been doing. You will then think about all the different activities and reasoning you have done during this Unit. Lastly, you will write about what you have learned about doing science and being a scientist.

Watch

**IDEO Video**

The video you will watch follows a group of designers at *IDEO*. *IDEO* is an innovation and design company. In the video, *IDEO* designers face the challenge of designing and building a new kind of shopping cart. These designers are doing many of the same things that you did. They also use other practices that you did not use. As you watch the video, record the interesting things you see.

*Top:* A trio of *IDEO* designers reviews a proposed concept framework together. *Middle:* A project team compares a series of models for a skate park layout. *Bottom:* The informal atmosphere of a lounge area acts as a backdrop to a group brainstorm.
After watching the video, answer the questions on the next page. You might want to look at them before you watch the video. Answering these questions should help you answer the Big Question of this Unit: How do scientists work together to solve problems?

Stop and Think

1. List the criteria and constraints that the design team agreed upon. Which criteria and constraints did the team meet? In your opinion, what other criteria and constraints were not included in the team’s discussion?

2. Why did the team split into smaller groups? What did the team hope to accomplish by doing this?

3. What types of investigations did you see the teams doing? What information were the teams trying to collect? Discuss how the information they collected helped the team design a better shopping cart.

4. Why do you think team members’ ideas were not being criticized during the initial stages of design?

5. Give at least three examples from the video of how this group of people kept themselves on track to reach their goal on time. (How did they keep the project moving along?)

6. Analyze the team’s final product. List three advantages and three disadvantages you see in the new shopping cart.

7. Compare the practices you saw in the video to the practices you used in the classroom. How are they different? How are they the same?

8. Give examples from the video of collaboration and design practices you did not use in the classroom.

9. List two aspects of the IDEO work environment you liked. List two aspects you did not like.
10. The IDEO workers have to take on extra responsibilities to maintain their fun, yet productive, work environment. Identify and discuss at least three of these responsibilities.

11. Relate the responsibilities you identified to working with a group in the classroom. Justify your choices using evidence.

Reflect

The following questions review the concepts you learned in this Unit. Your goal was to understand how scientists solve problems. You should start thinking about yourself as a student scientist. The things you are learning about how scientists solve problems will help you solve problems in the classroom and outside of school.

Write a brief answer to each question. Use examples from class to justify your answers. Be prepared to discuss your answers in class.

1. **Teamwork**—Scientists and designers often work in teams. Think about your teamwork. Record the ways you helped your team during this Unit. What things made working together difficult? What did you learn about working as a team?

2. **Learning from other groups**—What did you learn from other groups? What did you help other groups learn? What does it take to learn from another group or help another group learn? How can you make Plan and Solution Briefings work better?

3. **Informed decision making**—What is an informed decision? What kinds of informed decisions did you have to make recently? What do you know now about making informed decisions that you did not know before this Unit? What role do results from investigations play in making informed decisions? Provide an example of using results from an investigation to make a decision during this Unit.

4. **Iteration**—Simply trying again is not enough to get to a better solution or understanding. What else do you need to do to be successful? What happens if your design does not work well enough the second time? What if a procedure you are running does not work well enough the second time?
5. **Achieving criteria**—What is a criterion? How do you know which criteria are important? What if you cannot achieve all of them? How did you generate criteria? On which challenges were you able to achieve the whole set of criteria? How did you decide which ones to achieve?

6. **Running experiments and controlling variables**—What does it mean to do a fair test? What is hard about doing a fair test? What happens if you do not control important variables? Some variables are more important to control than others. Why? Use examples from class to illustrate. What did you learn about running experiments successfully that you did not know before? Use examples from class to illustrate your answer.

7. **Modeling and Simulation**—Sometimes a process in the world is too small or too large or too complicated to examine. When scientists need to study the process anyway, they often create models and then run simulations on the models. What modeling did you do in this Unit? You used modeling for three different purposes. What purposes did you use modeling for in this Unit? Simulation means running a model. What kinds of simulation did you do? Modeling and simulation are useful only if the model is similar to the real world in important ways. How did you make sure your models were similar enough to the real world for you to be able to learn from them? How did you make sure you were simulating rainfall in a way that was similar enough to the way it happens in the real world?

8. **Using cases to reason**—Scientists and engineers often have to solve problems that others have confronted before. When scientists and engineers work to solve a problem, they may write up their experience as a case study for others to learn from. They will even write up the case study if their solution did not work. This way, others can learn what not to do to solve the problem. You used case studies several times in this Unit. What are the benefits of using case studies to help you solve a problem?